

Bonding and Analysis of Composite TRAC Booms for NASA Science Missions, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

A new deployable spacecraft boom technology called the Triangular Rollable And Collapsible Boom (TRACTM-Boom) has been invented by the Air Force Research Laboratory and is being considered by NASA for numerous missions including the Near Earth Asteroid Scout (NEA Scout) and Lunar Flashlight solar sail missions being developed by NASA Marshall Spaceflight Center as well as the CORSAIR comet sample return mission being developed by NASA Goddard. The greatest risk/concern voiced by these mission development teams related to composite TRAC?-Boom technology is the highly nonlinear and time-dependent creep and stress relaxation behavior of the bonded ?ridge-joint? that joins the two circular flanges and endures sustained stress when the boom is flattened and stowed. To address this concern, Rocco proposes to improve the performance of the bondline in composite TRAC?-Booms by reinforcing the adhesive joint with high stiffness elements that allow higher packaging strains while minimizing creep. We also propose to validate a relatively low cost, out-of-autoclave process for affecting the bond, and validate analytical models to simulate the time- and temperature-dependent viscoelastic behavior of composite TRAC? bonded joint, and guide engineering qualification of the joints for future NASA missions. The results of the proposed Phase 1 program will include: 1) assessment of the feasibility of Rocco's creep-resistant bondline technology, 2) validation of an engineering framework (through model and test correlation) for flight validation of composite TRAC?-Boom designs, and 3) development of a Phase 2 plan for elevation of the technology from TRL 3 to TRL 5 for future NASA flight applications.

ANTICIPATED BENEFITS

To NASA funded missions:

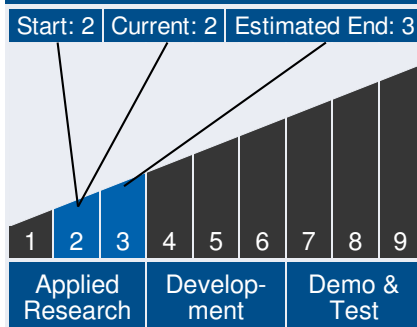
Potential NASA Commercial Applications: * CORSAIR comet sample return ?harpoon? * Deployable solar sails (NEA Scout) *



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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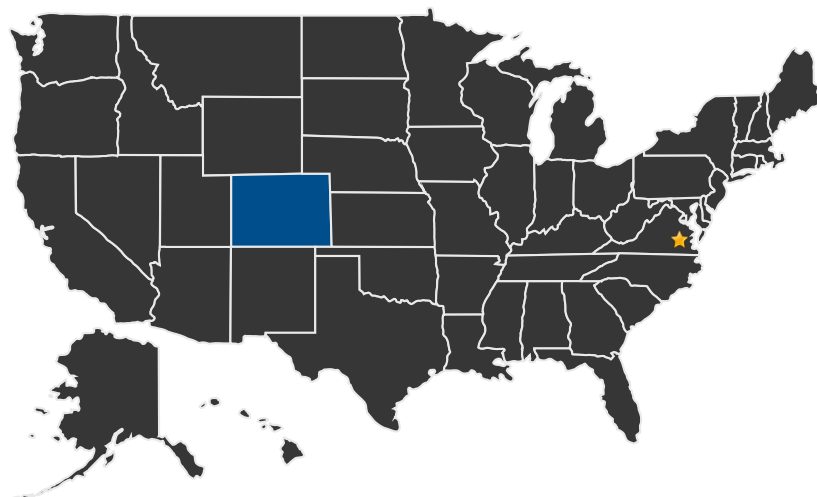


Deployable mono-pole and di-pole antennas for CubeSats *
Deployable CubeSat decelerators

To the commercial space industry:

Potential Non-NASA Commercial Applications: * Deployable solar sails * Deployable mono-pole and di-pole antennas for CubeSats * Deployable CubeSat decelerators

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Langley Research Center

Other Organizations Performing Work:

- ROCCOR, LLC (Louisville, CO)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23525>)

Management Team *(cont.)*

Principal Investigator:

- Thomas Murphey

Technology Areas

Primary Technology Area:

Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

└ Structures (TA 12.2)

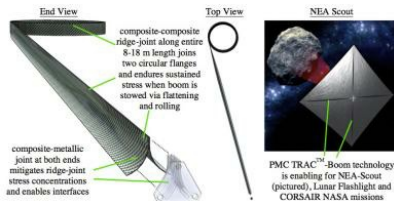
└ Lightweight Concepts (TA 12.2.1)

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IMAGE GALLERY



*Bonding and Analysis of Composite
TRAC Booms for NASA Science
Missions, Phase I*

DETAILS FOR TECHNOLOGY 1

Technology Title

Bonding and Analysis of Composite TRAC Booms for NASA Science Missions, Phase I

Potential Applications

* CORSAIR comet sample return ?harpoon? * Deployable solar sails (NEA Scout) * Deployable mono-pole and di-pole antennas for CubeSats * Deployable CubeSat decelerators